

WHAT IS CLAIMED IS:

1 1. A method for forming a three dimensional image by providing components of the
2 image in a series of frames to an image space, the method comprising:

3 scanning an image of a light shaping element over an image space wherein each of a
4 plurality of zones of the light shaping element is projected to each of a plurality of zones of
5 the image space; and

6 selectively illuminating portions of the light shaping element zones during each of a
7 plurality of frames during the scan, wherein each zone of the light-shaping element scatters
8 the illumination and at least a portion of the scattered illumination provides a component of
9 the three-dimensional image in the image space.
10

11 2. The method of claim 1, wherein during the scanning every zone of the light-shaping
12 element is projected to every zone of the image space.
13

14 3. The method of claim 1, wherein scanning the image of the light shaping element
15 further comprises reflecting the scattered illumination off a scanning optic towards the image
16 space.
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18 4. The method of claim 1, further comprising scanning the image of the light-shaping
19 element in a first direction over the image space.
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21 5. The method of claim 4, wherein the first direction is a vertical direction.
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23 6. The method of claim 4, further comprising scanning the image of the light-shaping
24 element in a second direction over the image space.
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26 7. The method of claim 6, wherein the first direction is a vertical direction and the
27 second direction is a horizontal direction.
28

29 8. The method of claim 1, wherein each zone of the light-shaping element scatters light
30 into a predetermined trajectory.

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32 9. The method of claim 8, wherein each predetermined trajectory is parallel to a
33 horizontal plane.
34

35 10. The method of claim 9, wherein the light-shaping element comprises a plurality of
36 sections, and during the scanning each section is projected to a different depth plane in the
37 image space.
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39 11. The method of claim 1, wherein each zone of the light-shaping element diffusely
40 scatters light.
41

42 12. The method of claim 11, wherein during the scanning each zone is projected to a
43 different depth in the image space.
44

45 13. The method of claim 1, further comprising scattering the scattered illumination from
46 the light-shaping element in a vertical direction at the image space to increase the vertical
47 dimension of a viewing zone.
48

49 14. A three dimensional display system which forms a three-dimensional image by
50 providing components of the image in a series of frames to an image space, the three-
51 dimensional display comprising:
52 a spatial light modulator;
53 a light-shaping element, which comprises a plurality of zones;
54 a scanning optic, which projects an image of the light-shaping element to an image space,
55 wherein during operation the scanning optic scans the image of the light-shaping element
56 over the image space, and in each of a plurality of frames during the scan, the spatial light
57 modulator selectively illuminates portions of the light-shaping element zones, and each zone
58 scatters the illumination, wherein at least a portion of the illumination scattered by the light-
59 shaping element provides a component of the three-dimensional image in the image space.
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61 15. The three-dimensional display system of claim 14, wherein the spatial light modulator
62 comprises a plurality of rows and columns of elements, and each row of elements
63 corresponds to a zone of the light-shaping element.
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65 16. The three-dimensional display system of claim 14, wherein each element of the
66 spatial light modulator corresponds to a zone of the light-shaping element.
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68 17. The three-dimensional display system of claim 14, wherein each zone of the light-
69 shaping element scatters illumination from the spatial light modulator into a predetermined
70 trajectory.
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72 18. The three-dimensional display system of claim 14, wherein each zone of the light-
73 shaping element is a grating.
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75 19. The three-dimensional display system of claim 14, wherein the light-shaping element
76 comprises a plurality of light shaping element sections, each light-shaping element section
77 comprising a plurality of zones, wherein each light-shaping element section is positioned in a
78 different plane along an axis.
79

80 20. The three-dimensional display system of claim 14, wherein the light-shaping element
81 diffusely scatters illumination from the spatial light modulator.
82

83 21. The three-dimensional display system of claim 20, wherein the light-shaping element
84 comprises a diffusing screen, and the diffusing screen is placed at a non-perpendicular angle
85 with respect to an optical axis.
86

87 22. The three-dimensional display system of claim 14, wherein each of at least two zones
88 of the light-shaping element are projected to a different depth plane in the light-shaping
89 element image.
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91 23. The three-dimensional display system of claim 19, wherein the scanning optic
92 comprises a cylindrical polygonal scanner, which reflects light from the light-shaping
93 element towards the image space.

94
95 24. The three-dimensional display system of claim 14, further comprising a condensing
96 lens, which focuses illumination from the light-shaping element onto the scanning optic.

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98 25. The three-dimensional display system of claim 14, further comprising a telecentric
99 relay, which relays the image of the light-shaping element to the image space.

100
101 26. The three-dimensional display system of claim 14, further comprising a vertically
102 diffusing screen positioned in the image space.